

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

## PCT

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13. April 2004

TBK - PATENT

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing  
(day/month/year)

08.04.2004

Applicant's or agent's file reference  
WO 28634

### IMPORTANT NOTIFICATION

International application No.  
PCT/EP 02/02518

International filing date (day/month/year)  
07.03.2002

Priority date (day/month/year)  
07.03.2002

Applicant  
NOKIA CORPORATION et al

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:



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13. April 2004

## PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT  
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference WO 28634	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/EP 02/02518	International filing date (day/month/year) 07.03.2002	Priority date (day/month/year) 07.03.2002
International Patent Classification (IPC) or both national classification and IPC H04B7/005		
Applicant NOKIA CORPORATION et al		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 5 sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"><li>I <input checked="" type="checkbox"/> Basis of the opinion</li><li>II <input type="checkbox"/> Priority</li><li>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li><li>IV <input type="checkbox"/> Lack of unity of invention</li><li>V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li><li>VI <input type="checkbox"/> Certain documents cited</li><li>VII <input type="checkbox"/> Certain defects in the international application</li><li>VIII <input type="checkbox"/> Certain observations on the international application</li></ul>		
Date of submission of the demand  06.10.2003	Date of completion of this report  08.04.2004	
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Lindberg, P  Telephone No. +49 89 2399-7975	



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. **PCT/EP 02/2518**

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-33 as originally filed

**Claims, Numbers**

1-21 received on 05.03.2004 with letter of 05.03.2004

**Drawings, Sheets**

1/8-8/8 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).  
☐ the language of publication of the international application (under Rule 48.3(b)).  
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority in written form.  
☐ furnished subsequently to this Authority in computer readable form.  
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	1-21
	No: Claims	
Inventive step (IS)	Yes: Claims	1-21
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-21
	No: Claims	

2. Citations and explanations

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP02/02518

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Reference is made to the following document:

D1: EP 461 314

D2: EP 684 707

**2. Novelty**

2.1 With respect to **claims 1 and 13**, D1, which is considered to represent the closest prior art, discloses a power control device from which the subject matter of claims 1 and 14 differs in that:

- the power control device is adapted to transmit and receive burst signals, which include a fixed training sequence; and
- in that a control means (23) control a detector means (19) so as to detect the output power of a power amplifier only during the output of the training sequence.

2.2 The subject matter of **claims 1 and 13** is therefore novel.

**3. Inventive step**

3.1 The problem to be solved by the present invention can therefore be seen as providing a simple and effective power calibration method.

3.2 The solution (controlling power only during the training sequence) to this problem proposed in **claim 1 and 14** is considered to involve an inventive step (Article 33(3) PCT) for the following reasons:

3.3 None of the cited documents, neither per se, nor in combination, discloses this feature of the invention according to independent **claim 1 and 14**.

Also none of the documents leads the person skilled in the art towards this solution.

3.4 Claims 2-12 and 14-21 are dependent on claim 1 and 13 respectively and as such

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/EP02/02518

also meet the requirements of the PCT with respect to novelty and inventive step.

- 3.5 Accordingly, the subject matter of claims 1-21 is novel and is considered to involve an inventive step, as well as considered to industrially applicable.

05-03-2004

Enclosure of March 5, 2004

EP0202518

Our ref.: WO 28634  
PCT-Application No.: PCT/EP02/02518  
NOKIA CORPORATION

**CLAIMS 1 to 21**

5

1. Power control device for calibrating the power of a transmitter or receiver in a mobile communication network comprising an antenna array (40), the device being adapted to transmit or receive burst signals to the antenna array (40) which burst signals include a fixed training sequence (10), the transmitter or receiver comprising a power amplifier (2), and the power control device comprising

a calibration means for calibrating the transmission or receiving power of the transmitter or receiver, the calibrating means including a summing means (74) connected to the antenna array (40) for summing transmission or reception signals, and a common calibrating device for calibrating the summed signals, and

a power control loop (14, 17 to 23) for controlling the output power of the power amplifier (2), the power control loop containing a detector means (19) for detecting the output of the power amplifier, and a control means (23) for controlling the detector means (19) so as to detect the output of the power amplifier (2) only during the time of output of the training sequence (10),

wherein the device is adapted to control the power based on the detected output power.

2. Device according to claim 1, wherein the control means (23) is adapted to issue a control signal which is applied to a control input of the detector means (19), the control means (23) being adapted to generate the control signal with a timing so as to operate the detector means (19) only when the power amplifier (2) outputs the fixed training sequence (10).

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3. Device according to claim 1 or 2, comprising a transmission branch and a reception branch, and a first switch means (70) for switching the connection of the summing means (74) either to the transmission branch or to the reception branch.

4. Device according to claim 3, comprising a second switch means (69) for switching the connection of the transmission branch either to the summing means (74) or first switch means (70), or to a reference coupler (72) for supplying a reference signal to the transmission branch.

5. Device according to claim 3 or 4, comprising a further switch means (64) provided in the transmission branch for temporarily blanking the transmission branch.

6. Device according to any one of the preceding claims, wherein the device is adapted to measure, for transmit calibration (Tx calibration), idle timeslots with only one column active.

7. Device according to any one of the preceding claims, wherein for receive calibration, a dummy burst is generated and modulated onto a carrier, the dummy burst is received in each branch of a transmitter, and the amplitude and phase differences between each path are measured and used as a new receive calibration offset.

8. Device according to any one of the preceding claims, comprising a chipset of a mobile terminal which is used for calibration.

9. Device according to any one of the preceding claims, comprising a passive coupling network in the antenna array



and a calibration board which works at radio frequencies.

10. Device according to any one of the preceding claims, comprising an open loop static power control for controlling the output power of a power amplifier, wherein the open loop static power control comprises a controllable attenuator means arranged upstream of the input side of the power amplifier, the controllable attenuator means being controlled by a control means of the device.

11. Device according to any one of the preceding claims, which is adapted to set the output power on the basis of information measured in a previous timeslot and no power corrections are made during a measured timeslot.

12. Device according to any one of the preceding claims, for application in a smart antenna structure comprising several antennas, including a power amplifier in each antenna path, a common attenuator, and a splitter arranged between the common attenuator and the antenna paths, each power amplifier including a power control loop.

13. Power control method for calibrating the power of a transmitter or receiver in a mobile communication network comprising an antenna array, wherein burst signals are transmitted to, or received by, the antenna array which burst signals include a fixed training sequence (10), the transmitter or receiver comprising a power amplifier (2), comprising a calibration step for calibrating the transmission or receiving power of the transmitter or receiver, the calibrating step including a summing step for summing transmission or reception signals of the antenna array, and a common calibrating step for commonly calibrating the summed signals,

the output power of the power amplifier (2) being

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controlled by a power control loop (14, 17 to 23) which includes a detector means (19) for detecting the output of the power amplifier, and a control means (23) for controlling the detector means (19) so as to detect the output of the power amplifier (2) only during the time of output of the training sequence (10),

wherein the power is controlled based on the detected output power.

14. Method according to claim 13, wherein the control means (23) issues a control signal which is applied to a control input of the detector means (19), the control means (23) generating the control signal with a timing so as to operate the detector means (19) only when the power amplifier (2) outputs the fixed training sequence (10).

15. Method according to claim 13 or 14, comprising a transmission branch and a reception branch, and a first switch means (70) for switching the connection of a summing means (74) performing the summing step either to the transmission branch or to the reception branch.

16. Method according to claim 15, comprising a second switch means (69) for switching the connection of the transmission branch either to the summing means (74) or first switch means, or to a reference coupler (72) for supplying a reference signal to the transmission branch.

17. Method according to claim 15 or 16, comprising a blanking step for temporarily blanking the transmission branch.

18. Method according to any one of the preceding method claims, wherein, for transmit calibration (Tx calibration), idle timeslots are measured with only one column active.

19. Method according to any one of the preceding method  
claims, wherein for receive calibration, a dummy burst is  
generated and modulated onto a carrier, the dummy burst is  
5 received in each branch of a transmitter, and the amplitude  
and phase differences between each path are measured and used  
as a new receive calibration offset.

20. Method according to any one of the preceding method  
10 claims, wherein the output power is set on the basis of  
information measured in a previous timeslot and no power  
corrections are made during a measured timeslot.

21. Method according to any one of the preceding method  
15 claims, for application in a smart antenna structure  
comprising several antennas, including a power amplifier in  
each antenna path, a common attenuator, and a splitter  
arranged between the common attenuator and the antenna paths,  
each power amplifier including a power control loop.